Space-Based Interferometric Detection of Extrasolar Planets

By

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Abstract:

Optical interferometry in space offers the prospect of microarcsecond precision astrometry of stars, enabling a wide range of problems in Galactic astronomy, stellar astrophysics, and planet detection and characterization to be addressed. The Space Interferometry Mission (SIM) will be the first space-based long baseline Michelson interferometer designed for precision astrometry, and will deliver 4 microarcsecond positions of stars down to 20 magnitude, in a reference frame defined by distant quasars. SIM will operate in an Earth-trailing solar orbit for a minimum of 5 years. It will be a powerful tool for discovering planets around nearby stars, through detection of the stellar reflex motion. The astrometric method complements the radial velocity technique which as already yielded many new planets, and has the additional benefit of measuring planetary masses rather than mass lower limits. In a frame defined by nearby reference stars, the single-measurement precision of SIM will be 1 microarcsecond, enabling searches for planets with masses as small as a few earth masses around the nearest stars. SIM will be able to fully characterize multiple-planet systems which are now known to exist. The mission also serve as a precursor for future astrophysics missions using interferometers, demonstrating several needed technologies. With a 10-m baseline, SIM will be capable of high dynamic-range aperture synthesis imaging at 10-milliarcsec resolution in the optical. It will also demonstrate interferometric fringe nulling to 1 part in 10000 needed for direct detection of light from extrasolar planets by the proposed Terrestrial Planet Finder mission.

Key words: Interferometry, extrasolar planet, planet detection, astrometry, reference frame

Brief Biography:

Stephen Unwin is Deputy Project Scientist for NASA's Space Interferometry Mission. He received his PhD in Radio Astronomy from Cambridge University in England, and worked for several years at Caltech, researching the radio structures of quasars and active galaxies. He now works in optical interferometry at the Jet Propulsion Laboratory, California Institute of Technology.